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FUNGICIDAL MANAGEMENT OF LEAF BLAST DISEASE IN RICE

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ABSTRACT
Evaluation of various fungicides against leaf blast of rice was carried out at Agricultural Research Station, Bavikere, Tarikere (Tq), Chikkmangalore (Dist.), Karnataka during kharif 2010 and 2011 season. A highly susceptible rice variety TO-39 was planted in Randomized Complete Block Design and the application of various fungicides viz Dithane Z -78 75 WP (0.2 %),Carbendazim(0.1%), Propiconazole 25 % EC (0.1 %), Mancozeb 75 % WP (0.2 %), Wettable Sulphur (0.3 %), Thiophanate methyl 70 WP(0.1 %), Tricyclazole (0.06 %), Benomy1(0.2%), Ediphenphos(0.1 %) and Kitazine (0.1 %) were given thrice at weekly interval. All the fungicides proved to be affective in the management of rice blast disease. Out of ten fungicides tested, Tricyclazole, Kitazine and Ediphenphos were found significantly superior in controlling the disease with the lowest PDI (16.01,18.01 and 18.52 respectively), also significant increase in yield in Tricyclazole sprayed plots(7783.33 kg/ha.) followed by Ediphenphos (6941.66kg/ha.), Kitazine(6850.00 kg/ha.) and other fungicides. The B:C ratio was also found higher in Tricyclazole (1:2.64), Ediphenphos (1:2.39) and Kitazine (1:2.31) sprayed plots compared to other fungicides and untreated control plots over two years. It is thus concluded that the fungicide Tricyclazole or Ediphenphos or Kitazine should be sprayed thrice at weekly interval for the management of leaf blast disease in rice.

KEY WORDS: Control, fungicides, *Pyriculara oryzae*, rice blast *Oryza sativa L*.

INTRODUCTION

Rice (oryza sativa L.) is one of the most important cereals of the world and is consumed by 50% of the world population (*Luo et al.,*1998). In India, it is cultivated on an area of 53.2 million hectares with a total production of 99.8 million tons. In Karnataka it is cultivated on an area of 1.53 million hectares with a total production of 3.80 million tons (Anonymous, 2011). This yield is very low as compared to other developed countries of the world and this low production is attributed to several biotic and abiotic factors.

Among the biotic factors disease is the most important factor which results in crop losses of $ 5 billion every year (Asghar *et al.,* 2007). Rice blast caused by *pyricularia oryzae* Cavara [synonym *pyricularia grisea* Sacc. The anamorph of *Magnaporthe grisea* (Herbert) Yaegashi and Udagawa], is one of the most destructive and wide spread disease (Jia *et al.,* 2000). This disease has caused significant yield losses in many rice growing countries e.g. 75% loss grains in India (Padmanabhan, 1965), 50% loss in Philippines (Awodera and Esuruoso, 1975) and 40% loss in Nigeria (Ou, 1985). In Brazil rice blast is considered to be one of the major yield constraints in both irrigated and upland ecosystems (Prabhu and Morais, 1986). Keeping this in view, efforts have been made to find out the efficacy of various fungicides on the management of leaf blast disease in rice.

MATERIAL AND METHODS

A field experiment was conducted at Agricultural Research Station, Bavikere in *kharif* season during the years 2010 and 2011. Rice nursery of highly susceptible cultivar TO-39 was sown in the month of June 2010 and June 2011. The healthy seeds were placed in the form of heaps on the Gunny bags and water was sprayed on the seeds with help of sprinkler, so that seed may get sprouted for sowing in the nursery after 2 days. The land was prepared by puddling method by applying one ploughing followed by two ploughing after one week. The plot size for each treatment was 2 x 6 meters with eight rows in each plot and plant to plant and row to row distance was 20 cm. 25 days old seedlings of susceptible cultivar were planted. Fertilizer was applied @ 100: 50:50 Kg NPK/ha. and Chloropyriphos was used as insecticides @ 1185 ml/ha. and weeds were controlled by Pretilaclor as weedicide @ 1.5 lt/ha. The experiment was laid out in RCBD with three replications and the fungicides viz Dithane Z -78 75 WP (0.2%), Carbendazim(0.1%), Propiconazole 25% EC (0.1%), Mancozeb 75% WP (0.2%), Wettable Sulphur (0.3%), Thiophanate methy1 70 WP (0.1%), Tricyclazole (0.06%), Benomy1(0.2%), Ediphenphos(0.1%) and Kitazine (0.1%) were sprayed thrice at weekly interval starting from the initiation of the disease.

The data regarding the occurrence of the blast disease was collected one week after the last application of fungicides by using the disease rating scale of 0-9 developed by International Rice Research Institute (IRRI. 1996) and then converting into per cent disease by using the formula.

$$\text{Disease \%} = \frac{\text{Sum of the scores} \times 100}{\text{Number of observation} \times \text{higest number in rating sacle}}$$

The data on the yield were recorded by marking 3 x 2 m section within each plot using a wire frame as described by (Seebold et al., 2004) and tillers within the frame were cut and harvested in order to determine the yield. The cost: benefit ratio was worked out based on the cost of fungicides, spray cost, yield and the market value of paddy during 2010 and 2011.

RESULTS AND DISCUSSION

Evaluation of different fungicides on leaf blast disease under field conditions and their ultimate effect on crop yield is given in the Table 1.During kharif 2010, the per cent disease index (PDI) was to the tune of 73.16. Proportionately different fungicides controlled the disease effectively. Among the different fungicides, the per cent disease index was significantly less(15.56) in Tricyclazole sprayed plots followed by Kitazine (17.63) and Ediphenphos (18.03) (Table.1). Correspondingly, maximum grain yield of 7600.00 kg/ha was recorded in Tricyclazole sprayed plot followed by Ediphenphos (6833.33kg/ha) and Kitazine (6766.67kg/ha) sprayed plots, with benefit cost ratio of 1:2.51, 1:2.30 and 1:2.22 respectively. Whereas, minimum grain yield of 3933.33kg/ha was recorded in control plot (Table.1). The fungicides like Carbendazim, Thiophanate methyl and Propiconazole showed intermediate results and the disease percentage recorded was 23.60%, 24.63% and 24.93% respectively.

Haq *et al.,* (2002) conducted an experiment to evaluate various fungicides like Captan, Acrobat, Bayeltan, Sunlet, Dithane M-45, Trimiltox and Derosal in controlling the macelial growth of *Pyricularia aryzae* under the laboratory conditions and found that Captan and Acrobat were the most effective fungicides.

During kharif 2011, significantly less PDI (16.46) was recorded in Tricyclazole sprayed plots followed by Kitazine (18.40) and Ediphenphos (19.01) as compared to the other treatments and unsprayed plot (PDI – 72.33). The maximum grain yield of 7966.67kg/ha was recorded in the plots that received Tricyclazole spray followed by Ediphenphos (7050.00kg/ha), Kitazine (6933.33kg/ha), Propiconazole (6500.00kg/ha) and Carbendazim (6366.67kg/ha) sprayed plots as compared to unsprayed plot (3983.33kg/ha) resulting benefit cost ratio of 1:2.77, 1:2.48, 1:2.39, 1:2.28 and 1:2.33 respectively. The fungicides like Carbendazim, Thiophanate methyl and Propiconazole showed intermediate results and the disease percentage recorded was 22.06 %, 23.73 % and 23.90 % respectively (Table.1).

The pooled data over the years on the intensity of disease indicated that the fungicide Tricyclazole (0.06%) was found superior in reducing the leaf blast disease of paddy (PDI value of 16.01) followed by Kitazine (0.1%) as with PDI value of 18.01, and Ediphenphos with PDI value of 18.52, compared to other treatments and control, though there was no significant difference between these treatments (Table.1). Correspondingly, a maximum grain yield of 7783.33kg/ha was recorded in plot in where Tricyclazole was sprayed followed by 6941.66kg/ha in Ediphenphos and 6850.00kg/ha in Kitazine sprayed plot with 96.63, 75.40 and 73.10 per cent increased yield respectively over control plot (3958.33kg/ha). The B:C ratio was also found higher in Tricyclazole (1:2.64) followed by Ediphenphos (1:2.39) and Kitazine (1:2.31) sprayed plots compared to other fungicides and control plot over two years.

Similar results regarding the efficacy of various fungicides has been reported by different researchers throughout the world like Varier et al., (1993) used eight fungicide for management of rice blast and seed treatment with tricyclazole @ 4g/kg seed proved effective after 40 days of sowing. Dubey (1995) conducted field trails of eight fungicides for control of *Pyricularia oryzae*, Topsin M+Indofil M-45 was proved to be most effective against leaf blast disease of rice. Minami and Ando(1994) reported that probenazole induce a resistant reaction in rice plants against infection by rice blast fungus. Enyinnia (1996) evaluated two systemic fungicides Benomyl and Tricyclazole on Faro-29, a rice cultivar at full booting stage and reported good control of natural infection of rice leaf blast. Filippi and Prabhu (1997) reported that propagation fungicide (40 g a.i. per Kg of seed) was effective in controlling leaf and panicle blast. Sood and Kapoor, (1997) evaluated 7 fungicides against leaf and neck blast of rice caused by *Magnaporthe grisea.* The fungicides were sprayed at the recommended rates at booting and heading stage. Tricyclazole was the most effective, reducing leaf and neck blast by 89.2% and 97.5% and increasing the yield 43.3% as compared with untreated control. Moletti *et al.,* (1998) conducted field trial against *Phyricularia oryzae*, and found that pyroqulion granules or wettable powder 2kg/ha once or twice gave good results against leaf blast.

Among the nine fungicides tested under field conditions, the fungicides viz Rabicide, Nativo and Score were the most effective against leaf blast disease with great reduction in the disease percentage which was 11.46% 12.15% and 12.85% respectively after the third week, while Tilt and Armure, exhibited intermediate effectiveness with 15.97% and 17.36% disease percentage(Usman Ghazanfar *et al*, 2009). Our results are in conformity with those of Sood and Kapoor, (1997), Tirmali *et al*. (2001), Prabhu *et al.* (2003) and Usman Ghazanfar *et al*, (2009) reported that fungicides application increases the yield of rice.In the present study, the fungicide Tricyclazole, Kitazine and Ediphenphos were found superior in reducing the leaf blast disease incidence and thus helped for getting highest grain yield and B:C ratio.

TABLE 1: Evaluation of fungicides on Leaf blast incidence, yield and their economics in rice

Treatments	Fungicide conc. (%)	Percent disease index (PDI)		Pooled	Yield (kg/ha)		Pooled	B:C ratio		Mean
		2010	2011		2010	2011		2010	2011	
T_1- Dithane Z–78 75WP	0.2	28.70	27.23	27.96	6111.67	6250.00	6180.83	1:1.74	1:1.88	1:1.81
T_2 - Carbendazim	0.1	23.60	22.06	22.83	6416.67	6366.67	6391.67	1:2.21	1:2.33	1:2.27
T_3 - Propiconazole 75% EC	0.1	24.93	23.90	24.41	6433.33	6500.00	6466.66	1:2.12	1:2.28	1:2.20
T_4 - Mancozeb 75% WP	0.2	27.60	25.46	26.53	6000.00	6116.67	6058.33	1:1.76	1:1.94	1:1.85
T_5 - Wettable Sulphur	0.3	30.56	29.80	30.18	5666.67	5716.67	5691.67	1:1.98	1:2.15	1:2.10
T_6 - Thiophanate Methyl 70 WP	0.1	24.63	23.73	24.18	6266.67	6233.33	6250.00	1:2.02	1:2.21	1:2.11
T_7 - Tricyclazole	0.06	15.56	16.46	16.01	7600.00	7966.67	7783.33	1:2.51	1:2.77	1:2.64
T_8 - Benomyl	0.2	29.03	27.93	28.48	6066.67	6216.67	6141.67	1:1.76	1:1.93	1:1.84
T_9 - Ediphenphos	0.1	18.03	19.01	18.52	6833.33	7050.00	6941.66	1:2.30	1:2.48	1:2.39
T_{10} - Kitazine	0.1	17.63	18.40	18.01	6766.67	6933.33	6850.00	1:2.22	1:2.39	1:2.31
T_{11}- Control	-	73.16	72.33	72.74	3933.33	3983.33	3958.33	-	-	-
SEm ±	=	0.91	0.87	0.83	126.67	223.33	167.39			
C.D(0.05)	=	2.68	2.56	2.55	373.33	658.33	503.73			
C.V.(%)	=	5.52	5.38	5.33	5.540	6.188	5.743			

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